are relatively free of unwanted side effects. It is expected that pancuronium will be available for clinical use in the near future.

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Recent Advances in Obstetric Anesthesia

The most important recent advances in obstetric anesthesia are not the new drugs or techniques that have been introduced to provide better analgesia. Rather, they are the major modifications of older established techniques with a view toward preventing serious anesthetic complications such as maternal hypotension and aspiration pneumonitis.

Maternal hypotension may occur in as many as 80 percent of parturients following regional anesthesia for cesarean section. However, with aggressive prophylactic measures the incidence decreases to less than 15 percent. Hypotension is due to a combination of sympathetic blockade and compression of the vena cava by the gravid uterus. Anticipating sympathetic paralysis, many anesthesiologists routinely administer a liter of lactated Ringer's solution intravenously and ephedrine 50 mg intramuscularly within 20 minutes of the block. Immediately following the block and before operation, the uterus is displaced off the inferior vena cava. Left uterine displacement is most easily and successfully accomplished with the use of a mechanical device attached to the surgical table. If such an apparatus is not available, a small pillow placed under the right hip, together with lateral tilting of the surgical table, occasionally is effective in producing left uterine displacement. Should hypotension occur, recent studies have indicated that vasopressors such as ephedrine, Wyamine® or Aramine® are effective in restoring uterine blood flow following spinal hypotension. Pure vasoconstrictor drugs such as Vasoxyl® or Neosynephrine® should be avoided, as these drugs, although restoring the blood pressure, produce further decreases in uterine blood flow with subsequent fetal hypoxia and acidoses.

Aspiration pneumonitis is most easily prevented by avoiding general anesthesia. However, if general anesthesia is used, many anesthesiologists routinely protect the airway of the patient by endotracheal intubation. Because regurgitation or vomiting may also occur during intubation or extubation of the trachea, the following prophylactic techniques are being used with increasing frequency. Before induction of anesthesia (up to 2 hours) one ounce of oral antacid is administered. Maternal gastric pH will immediately rise above dangerous levels. If the patient is awake, intubation is not appropriate, and extremely rapid ("crash") induction of anesthesia is performed with intravenous thiopental and succinylcholine. Because muscular fasciculations caused by succinylcholine may be associated with increased intragastric pressure and a greater tendency for the patient to regurgitate, a 3 mg dose of curare is given 5 minutes before induction of anesthesia. An assistant applies cricoid pressure to compress the esophagus before and during endotracheal intubation. The endotracheal tube is left in place until the patient awakens; she is placed on her side in the head down position, and with suction apparatus immediately available, the endotracheal tube is removed.

One of the greatest tragedies in medicine is death of a mother during childbirth. Complications of anesthesia account for up to 10 percent of all maternal deaths. Many of the deaths might be preventable by use of prophylactic techniques which have been discussed.

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Halogenated Anesthetic Agents

The current status of halogenated anesthetic agents is best characterized by the term "unsteady state." While much new information is

being gathered concerning safety and toxicity, the utilization of the agents at any given time seems to be a result of the forces of experience, emotion and fear of malpractice. The agents still remain an important mainstay of inhalation anesthesia.

Halothane continues to be widely used. Since its introduction in the late 1950's it has provided pleasant and safe anesthesia for millions of patients. The agent offers great flexibility, it is not unpleasant to smell, it is non-explosive, the incidence of nausea and vomiting is small, high concentrations of oxygen can be used. These are real and important advantages to physician and patient. In spite of considerable looking no one has found this drug to possess a higher mortality or morbidity rate than any other widely used approach to anesthesia for major operation.

The occurrence of "hepatitis" associated with use of halothane is apparently real. The most popular opinion is that this results from sensitization. Evidence for sensitization is its low incidence (one in thousands), lack of dose dependence, apparent increased incidence and rapidity of recurrence with repeated halothane use and failure to produce the lesion in laboratory animals. There is some recent evidence from chronic exposure at very low dosage, however, which suggests sensitization may not be the only factor responsible for hepatic injury.

Fluroxene has never been widely popular. In recent years evidence revealing higher values for blood pressure, cardiac output and alveolar ventilation has resulted in increasing use of this drug. There are now reports of hepatitis occurring with fluroxene, and the agent is explosive in the anesthetic range. Nausea and vomiting appear to be more common than with halothane. There are no data which relate the higher cardiorespiratory values to improved patient welfare, and this drug, which has been on the market for many years, does not appear to be headed for great popularity.

Methoxyflurane has been rather definitely associated with high output renal failure. Unlike the hepatic lesion of halothane, this lesion, available evidence in humans and laboratory animals suggests, is a reproducible, dose-dependent toxic protoplasmic effect. Low vapor pressure and high solubility are at once advantages and disadvantages of the agent. They do reduce its flexibility and versatility. As a result of this and the renal toxicity, methoxyflurane appears to be diminishing in clinical usage and importance.

Perhaps the most important aspect of the current status of these agents is the realization that they are metabolized to a large extent. Not many years ago, inhalation agents were thought to be excreted unchanged via the lungs. Now biodegradation is known to occur in surprisingly large fractions of the dosage administered. Metabolites or altered metabolic activity may explain much of the toxicity, idiosyncracy and species variability which has been characteristic of the evaluation of anesthetic agents over the years.

Suggestions have been made that contamination of operating room atmospheres may be responsible for abortions, hepatitis and perhaps other untoward events affecting operating room personnel. Without debating the validity of such claims, there is no firm evidence that halogenated agents are the important offenders.

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Dissociative Anesthesia

The need has been great for a method of producing analgesia and amnesia in patients for short periods of time without depressing respiration and circulation. To date ketamine is the best answer to this need since its use is characterized by catalepsy, amnesia and analgesia. The state has been designated as dissociative anesthesia since the patient truly seems disassociated from his environment. During this state blood pressure and pulse rate are more likely to be elevated than depressed. Minute volume of respiration usually is not decreased to a significant degree unless too large a dose is given too rapidly. Pharyngeal and laryngeal reflexes usually remain active enough to protect against aspiration of foreign material into the tracheo-bronchial tree.

Ketamine (Ketaject,® Ketalar®) is not the perfect agent and undoubtedly more satisfactory